rediscuss the results. This Professor Poor has done. His conclusion is that these observations, when properly interpreted, also confirm his theory of the variable form of the sun, and curves are given which confirm his views.

It should be stated, however, that the differences derived from the Göttingen observations are extremely small, and that Ambronn was of the opinion that the differences between his determinations of the polar and equatorial diameters were due to accidental errors.

RELATION BETWEEN THE MOTION IN THE LINE OF SIGHT, AND THE VARIATION IN BRIGHTNESS OF VARIABLE STARS.

The discovery of new variable stars has gone on with increasing rapidity in recent years, until now about three thousand variables are known. The majority of these have been found by photographic means at the Harvard Observatory. Fair progress has been made also in the study of the light-curves of these stars, and definitive elements have been found for several hundred of them. It can not be said, however, that great progress has been made in the determination of the underlying causes which produce the variations. In the case of the Algol stars it is sure, both from theoretical considerations, and from spectroscopic determinations of their motion, that the variation is caused by a relatively dark, eclipsing body. The brilliant lines of incandescent hydrogen, which appear near maximum in the spectra of many stars of long period indicate with considerable certainty that the variations in their light are associated with eruptive disturbances of some sort. It was long ago pointed out that our sun is probably a variable star of long period and small range, and many variable stars may exist, whose changes are caused by spots of greater or less size. Nevertheless, it still remains true that for the great majority of variable stars no sure key has been found to the secret of their changes.

Two recent bulletins of the Lick Observatory (Nos. 62 and 83) have dealt with a new and extremely important phase of this question. In these, Dr. Ralph H. Curtiss, of that observatory, shows that for the well-known variable star W Sagittarii there is a most intimate relation between the velocity of motion in the line of sight and the changes in brightness. This was well indicated by a comparison of the Lick determinations of motion with the early observations of the light-curve by Schmidt. The similarity is most strikingly shown, however, when the velocity-curve is compared directly with the light-curve derived from recent photometric measurements by Professor Pickering, given in the Harvard Annals, Vol. 46, Part 2. A comparison of these curves shows a close resemblance even in the details, and proves conclusively that both phenomena are due to the same underlying causes. Incidentally a striking proof is furnished of the accuracy of the two widely separated investigations thus critically compared. Dr. Curtiss's work marks a distinct step in advance in the study of variable stars, and it is to be hoped that the research may be extended to as many and as faint variables as possible.

S. I. BAILEY.

CURRENT NOTES ON METEOROLOGY.

BRIEF COMMENT ON RECENT ARTICLES.

IN the recent numbers of the *Meteorologische Zeitschrift* (Nos. 7–10, Vol. XXII., 1905) there have been many contributions of general scientific interest, on which the following brief comments are made:

The exploration of the free air at great heights has been giving records of very low temperatures. On March 2, last, at a height of 9,717 meters, the temperature was — 85.4° C., and on April 4, at 11,010 meters, it was — 79.6° C. These records were obtained by means of *ballons-sondes* sent up from Vienna. So rapid has been the accumulation of data from the free air that the mean annual temperature and the vertical temperature gradients at each interval of one kilometer up to a height of eleven kilometers have been determined, using the results obtained on nearly 600 balloon ascents.

ANTARCTIC meteorology is making rapid progress. On the Swedish expedition, under

Otto Nordenskjöld, observations were continued for twenty months, from March, 1902, to October, 1903, on Snow Hill Island (lat. 64° 22′ S.), and for seven months on Paulet Island (lat. 63° 22′ S.). The low mean annual temperature, 10.8° F., resulted from the low summer mean of 28.2°, this being the lowest Antarctic summer mean on record with the exception of that of the *Discovery* expedition. The minimum was —42.5° F.; the maximum, 48.7° F. The maximum temperatures occurred in spring and fall. The prevailing wind was southwest, and wind velocities showed no striking relation to pressure changes. Rain fell occasionally. The cirrus clouds moved from between west and west-southwest, and the same direction was noted in the intermediate clouds. The winter was clearer than the summer, when fogs prevailed.

THE "Magnetic and Meteorological Observations made by the 'Southern Cross' Antarctic Expedition, 1898–1900," under the direction of C. E. Borchgrevink (London, 1903), include the records made at Cape Adare from March 3, 1899, to January 28, 1900, the first winter records from the Antarctic continent (lat. 71° 18′ S.; long. 170° 9′ E.). Anticyclonic winds from east-southeast to south prevailed (41 per cent.); calms were noted nearly half of the time (41 per cent.). The curious fact was noted that the lowest pressure sometimes occurred with the *end* of a storm.

THE laws governing the size of rain-drops have received some attention, notably of late at the hands of Defant, of Innsbruck, who reaches the following conclusion. The formation of drops depends upon the combination of smaller droplets, but, contrary to the views of Reynolds and Lenard, this union is between droplets of the same size, or of nearly the same size. Drops of unequal size unite less easily the greater the difference in their sizes.

As the result of actinometrical measurements made on Mont Blanc in August and September, 1904, Hansky finds the most probable value of the solar constant 3.23 calories.

Das Gewitter, by Albert Gockel, 2d edition, Köln, 1905, is an excellent 'popular' discussion of present knowledge concerning thunderstorms, including lightning, lightning rods and atmospheric electricity in general.

CIRRUS clouds, on account of their delicacy and beauty, offer an attractive field for individual non-instrumental study, which may lead to interesting conclusions regarding the various methods of formation of these clouds. Osthoff, of Cologne, has recently made a considerable investigation of this sort, which will prove interesting to any one undertaking a similar quest.

THE transparency of fog has been experimentally investigated by Haecker, of Kiel, by means of a new method depending on exact photometric measurements of the visibility of surfaces at different distances. The instrument used is a 'polarization-photometer.' A practical result of such work would be the application of the results to lighthouses, ships' lights, etc.

A REMARKABLE 'dust fog,' observed in the Malay Archipelago in October, 1902, of such density as to interfere with navigation, has been investigated by the Batavia Observatory staff, large numbers of circular letters of inquiry having been sent to ship captains whose business took them to those seas at the time in question. The causes of this remarkable dust fog have been sought in the deficient rainfall of the year 1902; in extended forest fires, especially in Borneo and southern Sumatra, and in the transportation of dust by the southeast trade from Australia. As the progress of the dust from Australia could be followed, by successive stages, northward, the latter cause was doubtless the most important one.

MEINARDUS of Berlin has been paying special attention to the relation between the general winds, the circulation of the water in the North Atlantic Ocean and the weather of adjacent lands. His latest conclusions are summarized as follows, A and B being groups of conditions which occur in association with one another.

A. 1. Weak Atlantic circulation (August–February).

2. Low water temperatures on the European coast (November–April).

3. Low air temperatures in central Europe from February to April.

4. Little ice off Newfoundland in spring.

5. Heavy ice off Iceland in spring.

6. Bad wheat and rye harvests in western Europe and northern Germany.

B. 1. Strong Atlantic circulation (August–February).

2. High water temperatures on the European coast (November–April).

3. High air temperatures in central Europe from February to April.

4. Heavy ice off Newfoundland in spring.

5. Little ice off Iceland in spring.

6. Good wheat and rye harvests in western Europe and northern Germany.

The wind observations made during the Antarctic expedition of the *Gauss* show that the station was on the poleward side of the barometric depression which surrounds the Antarctic ice. There were few winds from the western quadrant, and an increase of pressure to the south, with an anticyclone in that direction, must be assumed. The station was, on the whole, nearer the circumpolar low-pressure ring than the anticyclone. Cyclonic weather was more common than anticyclonic. Low temperatures prevailed with westerly winds and during calms. Easterly winds brought a rise of temperature.

Meteorological observations during the solar eclipse of August 30, last, made at Bernau, in southern Germany, showed that the temperature fell from 65.8° to 59.7° in ten minutes, and then rose again. The wind fell from a moderate velocity to a calm during the eclipse, and then increased again.

R. DeC. Ward.

NOTES ON THE HISTORY OF NATURAL SCIENCE.

HIPPOCRATEAN FISHES.

Included in the *Corpus hippocraticum* is, next after Herodotus, one of the oldest of Greek prose writings, a work 'On Regimen,' in four books, by an unknown author, yet regarded by Galen as not unworthy of the 'father of medicine' himself. Throughout all antiquity, this work, especially the second book, was held in high esteem; nor can its interest be said to have vanished at the present day, whether regarded from a historical, literary or purely scientific standpoint. In that part of the second book which treats of the dietetic value of various plants and animals, as many as fifty-two species of the latter are enumerated, seventeen of which are fishes; and their order of arrangement is such as to have suggested to Burckardt[1] the idea of a definite system, called by him the 'Coan scheme of classification.'

Notwithstanding the large number of fishes mentioned in this work, some of the names occurring here for the first time, I have been unable to find any reference to it in ichthyological literature. Both Littré and Fuchs, in their translation of the text—there is no English version—attempt a precise identification of species, but judged by the standard set by Hoffman and Jordan in their 'Catalogue of Greek Fishes,' it can not be said that these classicists have been uniformly successful. A comparison with the catalogue referred to shows that at least ten of the Hippocratean species can be recognized with certainty, five are doubtful, and the remaining two may be despaired of as hopeless. One of these, ἐλεφιτίς, also written ἐλεφητίς, seems to be peculiar to the work in question, and no one has ventured a conjecture as to its meaning.

Of great importance for the early history of ichthyology are the abundant notices contained in Athenæus, 90 species of fishes being enumerated by him in alphabetical order. The extent to which this author drew upon Dorion's compendium, and the sources from which this in turn was derived, have been set forth in an extremely interesting essay by Wellmann.[2] From this we take the following estimate of Dorion's treatise, citations from the latter occurring in thirty-four passages of Athenæus:

Die erhaltenen Fragmente zeigen, dass das Werk in ziemlich umfassender Weise die Fischwelt be-

[1] 'Das koische Tiersystem,' *Verh. Naturf. Ges. Basel,* XV., pp. 377–414, 1904.

[2] *Hermes,* Vol. XXIII., pp. 179–193 (1888). Other valuable references to the early literature are given in the chapter contributed by Eugene Oder ('Ueber Fische und Fischfang') to Susemihl's 'History of Alexandrian Literature,' Vol. I., 1891.